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UNCLASSIFIED- INFORMATION ON SOVIET BLOC INTERNATIONAL GEOPHYSICAL COOPERATION - 1959

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INTERNATIONAL GEOPHYSICAL COOPERATION PROGRAM-- SOVIET-BLOC ACTIVITIES

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I. ROCKETS AND ARTIFICIAL EARTH SATELLITES

First Results of Moon Shot Published in "Izvestiya"; Launch-to-Impact Guidance Claimed

The following is a complete translation of a Tass report giving the first results obtained from the launching of the Soviet cosmic rocket to the Moon.

"The Soviet cosmic rocket, launched on 12 September 1959, reached the surface of the Moon on 14 September at 0002:24 Moscow time.

"The flight of the multistage Soviet cosmic rocket to the Moon proceeded strictly according to predetermined calculated trajectory. All the systems, apparatus, and elements of the rocket operated normally during the flight.

"The radio equipment installed aboard the rocket guaranteed reliable tracking from the Earth during its flight, beginning from launching up to the moment the container with scientific apparatus reached the surface of the Moon.

"The successful operation of the ground measuring complex made it possible to continuously control the conformity of the actual flight trajectory with calculated data, to give a reliable forecast of the impact on the Moon, and to determine the region of the hit.

"An analysis of the actual trajectory of the motion of the second Soviet cosmic rocket, based on the recorded data of all forms of measurements and observations, makes it possible now to make the first, more accurate definition of the region of impact of the container with the scientific and measuring apparatus and the last stage of the rocket. The processing of the observational data indicates that the container of the second Soviet cosmic rocket dropped on the surface of the Moon east of the Sea of Brightness near the crater of Aristyllus, the crater of Archimedes, and the crater of Autolycus. The selenographic latitude of the point of impact of the container with the Moon's surface, according to the obtained data, was equal to plus 30 degrees, and the selenographic longitude was equal to zero. The deviation of the point of the lunar landing of the instrument container from the center of the visible disk of the Moon is approximately 800 kilometers.

"At the moment of the container's encounter with the Moon, its trajectory was inclined at an angle of 60 degrees to the lunar surface. At the same time, the velocity of the container relative to the Moon was about 3.3 kilometers per second.

"The processing of the obtained data confirms that the last stage of the cosmic rocket also reached the surface of the Moon.

"As already reported, the following were to have been done during the flight of the second Soviet Cosmic rocket to the Moon: investigation of the magnetic field of the Earth and the magnetic field of the Moon, the investigation of the bands of radiation around the Earth, the investigation of the intensity of cosmic radiation, the investigation of heavy nuclei in cosmic radiation, the investigation of the gaseous component of interplanetary matter, and the study of meteor particles.

"An examination of the materials obtained as a result of the conducted investigations confirmed that the scientific and telemetric apparatus installed in the container functioned normally.

The initial interpretation of the telemetric material has been made.

"The preliminary data obtained already makes it possible now to determine the following:

"A magnetic field near the Moon, according to the data of the magnetometer recordings and within the limits of its sensitivity and the deviation error (about 60 gamma), was not discovered.

"Measurements of the intensity of radiation near the Moon disclosed no band of radiation of charged particles. This fact agrees with the results of the magnetic measurements.

"In cosmic space on the travel line of the rocket, measurements were made of the total flow of cosmic radiation, of streams of helium nuclei (alpha particles), of the nuclei of carbon, nitrogen, oxygen, and the heavier nuclei entering into the composition of cosmic rays.

"Additional data on X-rays, gamma rays, electrons of high and low energy and high-energy particles were obtained.

"Measurements were made within the limits of the Earth's bands of radiation.

"Recordings were made of the currents created by particles of ionized gas by the falling of positively charged particles from the surrounding medium into four traps installed in the container. The magnitude of the recorded currents changed along the travel line of the rocket; preliminary estimates indicate that between the Earth and the Moon there are regions where the concentration of ionized particles is less than 100 particles per cubic centimeter. During the approach to the Moon, at a distance of about 10,000 kilometers, the recorded currents increase. This can be explained either by the existence of an envelope of ionized gases around the Moon, a unique lunar ionosphere, or by the presence of a zone around the Moon of an increased concentration of corpuscles with energies of about tens of volts.

"New data on micrometeors were obtained.

"Further processing and analysis of the obtained materials is being done.

"As this work is completed, the results of the conducted investigations will be published."

"The creation of a multistage cosmic rocket, of motors, of a system of control in flight and of the complex of ground facilities, ensuring the precise launching and highly accurate travel of the rocket to the Moon, and also the reliable control during the flight of the rocket up to the moment of encounter with the Moon is an outstanding success of Soviet science and engineering.

"The launching of the second Soviet cosmic rocket, the complex of scientific investigations conducted, and the attainment of the surface of the Moon makes a significant contribution to world science and to man's conquest of the cosmos." ("On the First Findings of the Launching of the Cosmic Rocket to the Moon"; Tass report; Moscow, Izvestiya, 22 Sep 59, p 2)

Soviet Comments on Their Lunar Rocket

L. I. Sedov remarked that an analysis of the radio signals received from the rocket indicates that the motion of the final stage was very close to that computed. (Moscow, Pravda, 13 Sep 59, p 2)

The director of the Abastumani Observatory, Academy of Sciences Georgian SSR, Kharadze, stated that during the night of 13 September (clear atmosphere), twelve photographs were taken of the sodium cloud released 12 September by the cosmic rocket. A comparison was made with control photographs. The moment of the burst was determined; the coordinates of the place of the burst were established; the velocity of expansion and the volume of the sodium cloud (artificial comet) were determined. The sodium cloud was observed for a period of 4 minutes. It expanded in space with great velocity and was 600 kilometers in diameter after 4 minutes. On the large meniscus telescope of the observatory, photographs of the rocket itself were obtained for 1 1/2 hours, up to the time the sodium cloud was ejected at a distance of about 130,000 kilometers from the earth.

From the astrophysical observatory of the Academy of Sciences Armenian SSR came the information that photographs of the sodium cloud were made both with cameras made specially for the observation of artificial satellites and with a series of telescopes at the observatory. On two photographs obtained with the 20-inch reflector of the Schmidt system, the expansion and the fading of the sodium cloud were clearly discerned. These afforded the possibility of determining accurately the coordinates of the cloud, its change from photograph to photograph, and thus the rate of its expansion.

A number of photographs of the artificial comet were taken with special cameras by the associates of the Byurakan station for the observation of artificial satellites.

The director of the Tashkent Observatory of the Uzbek Academy of Sciences reported that, at the moment of the launching of the cosmic rocket to the moon, associates of the Tashkent Observatory were on duty and paid particular attention to observations of the artificial comet (sodium cloud). The Tashkent astronomers have five special photographic devices at their disposal and were successful in getting a great number of photographs. The task of the observatory was to determine the precise moment of the formation of the comet, and it can now be announced that they were successful in this assignment. ("Astronomers Observed the Artificial Comet," unsigned article, Moscow, Pravda, 14 Sep 59, p 2)

At a press conference for Soviet and foreign correspondents at the Academy of Sciences USSR on 14 September 1959, the vice-president of the Academy, A. V. Torpchiyev, announced that radio signals were sent back during the flight of the rocket and that a great many recordings were made which are now being processed. He said further that all the scientific instruments functioned normally right up to the very moment the instrument package collided with the moon. The trajectory of the rocket was determined by radio with the aid of special automatic equipment on the ground.

At the same press conference, L. I. Sedov said that the success of the lunar rocket was due primarily to the accuracy of its automatic equipment. For example, the acceleration had to be maintained within one meter per second, the error of the angular velocity had to be less than one degree, and the launching time had to be within a few seconds of the calculated time. He said also that the trajectory of the rocket was very close to the one calculated in advance.

S. N. Vernov announced that the rocket contained special instruments for measuring the magnetic field of the earth and moon, for the study of cosmic radiation and slowly moving matter in space, made up of atoms of gas and meteoric particles.

Prof B. V. Kukarkin announced that photographs of the artificial comet (sodium cloud) were taken at Tbilisi, Abastumani, Stalinabad, Byurakan (Armenia), Alma Ata, Ashkhabad, Odessa, Kislovodsk, and several other places and that photographs of the rocket itself had been taken with large optical instruments at observatories in Alma Ata, Byurakan, and in the Crimea.

Prof Yu. D. Kalinin discussed the problem of studying the magnetic field of the earth and of the moon with special instruments installed in the rocket, on the basis of which a contribution is expected to the solution of the problem of the origin of the earth's magnetism.

Ye. K. Fedorov discussed the study of the matter contained in the cosmic space through which the lunar rocket traveled and announced that the results of the scientific investigations made during the flight of lunar rocket, after analysis and processing have been completed, will be made available to scientists of all nations. ("Important Landmark in the History of Civilization," unsigned article, Moscow, Pravda, 15 Sep 59, p 2)

The sodium cloud ejected by the second Soviet cosmic rocket on its way to the Moon was photographed at the mountain station of the Pulkovo Observatory near Kislovodsk. The position of the cloud in the star sky coincided almost precisely with that previously calculated.

The time is considered near when it will be possible to establish an automatic station on the Moon capable of recording and transmitting to Earth, physical and astronomical observations. Such a station is a preliminary stage in building a manned scientific observatory on the Moon.

At the time of the launching, the Moon was in an extremely favorable position for astronomical and radiophysical observations during the flight of the cosmic rocket. Soviet astronomical observatories in the southern regions of the USSR conducted extremely careful observations of the rocket for more accurately defining its orbit. ("Astronomy Becomes an Experimental Science," by A. Mikhaylov, chairman of the Astronomical Council, director of the Pulkovo Observatory, Corresponding Member of the Academy of Sciences USSR; Moscow, Pravda, 18 Sep 59, p 3)

B. Kukarkin, deputy chief of the Astronomical Council of the Academy of Sciences USSR and Doctor of Physicomathematical Sciences, predicts the establishment of continuously operating autmoatic instruments on the Moon and space-stabilized artificial Earth satellites which will make it possible to discover weak nonstationary stars and to conduct systematic investigations of them using the most modern methods.

Manned flights to other planets are possible, but will probably not be made as quickly as investigations of these celestial bodies with the aid of automatic instruments, says Kukarkin. Indeed, he continues, it is impossible to send a man into space until his life during the flight and his safe recovery can be guaranteed. ("Next--Mars and Venus," by B. Kukarkin; Moscow, Pravda, 20 Sep 59, p 6)

Prof V. Dobronravov, Doctor of Physicomathematical Sciences, gave the following information on the successful Moon shot attempted by the Soviets on 12 September.

Soviet scientists and engineers have opened a new page in the investigation of cosmic space and have again demonstrated to the whole world, with the launching of the second cosmic rocket, that they occupy the leading position in creating the most powerful and advanced rocket motors.

The calculation of the trajectory of a cosmic rocket is an extremely complex mechanical and mathematical problem. When the rocket moves in the Earth's field of gravitation, i.e., up to a distance of approximately 310,000 kilometers, the character of the motion and the form of the trajectory is mainly determined by the Earth's gravity. Nevertheless, the Moon's gravity, while small in comparison with that of the Earth, exerts a certain perturbing action and for precise calculation of the rocket's motion, it is necessary to know the perturbation in question numerically and to include it in the calculations. When the rocket draws near the Moon, at a distance of 66,000 kilometers from the latter, the Moon's attraction will predominate but the Earth's attraction will exert a disturbing action which must be taken into consideration. Thus, to calculate the precise trajectory of a rocket during its ballistic flight from the Earth to the Moon, it is necessary to solve, so to speak "the

problem of the motion of three bodies" under the action of the force of their mutual attraction. The problem is facilitated by the fact that the mass of one body (the rocket) is insignificantly small in comparison with the masses of the other two bodies. Despite this, the problem remains extremely complex, requiring the integration of a complex system of differential equations. Here, enters the use of Soviet computers.

The next problem, which is no less important, is injecting the rocket into its trajectory. For this purpose it is necessary to calculate still another supplementary trajectory, the transition trajectory which begins at the launching point and ends at a definite, earlier determined point of the main trajectory of its future flight.

The rocket moves along the transition trajectory under the action of the thrust developed by the motors. The transition trajectory must be computed so that at its end, with motor cut-off, the rocket has attained the required cosmic speed and the direction necessary to carry it along the precalculated trajectory on the basis of the three-body problem.

Thus, the rocket, during its motion along the transition trajectory, must be controlled and must not deviate in the least from the calculated transition trajectory. To accomplish this, the rocket must have an automatic control system for its course which either acts independently according to its own program or is subject to commands from a control panel at its launch point.

Soviet specialists calculated the Earth-Moon trajectory carefully and with an accuracy down to the minute and second, and launching was conducted faultlessly injecting the rocket into its trajectory at the required speed. The trajectory of the rocket during its flight to the Moon was a certain hyperbola. To the successful launching in the present case, the important circumstance that the second Soviet cosmic rocket, although part of the last stage of a multistage rocket, was, nevertheless, a guided rocket. This must be noted separately as a new great achievement of Soviet rocket technology.

For transmitting to Earth all of the data obtained by the scientific apparatus and for communication with the Earth, the rocket was equipped with appropriate radio apparatus consisting of several transmitters operating on different frequencies. In the rocket's instrumentation, another novelty must be noted. Installed in the container with the scientific research apparatus of the radio technical system was a lunar altimeter. When the container with the apparatus began to near the lunar surface, the altimeter recorded the altitude of the container over the Moon in consecutive moments of time.

The total weight of the second Soviet cosmic rocket consisted of 1,511 kilograms less fuel.

After the launching of the rocket, the container with the apparatus was separated from the rocket. As a result, the trajectories of the container and the rocket differed. The motion of the container carrying the pennant of the Soviet Union was tracked up to its encounter with the Moon's surface.

The successful realization of the launching of a rocket to the Moon indicates that Soviet scientists and engineers have reached a new great stage in the study of cosmic space: the creation of controlled cosmic rockets and their launching according to precisely calculated trajectories into the region of the Moon and down to its surface.

The present achievement must be positively consolidated. A detailed investigation of the region of the Moon is necessary. For this purpose launchings with such trajectories as those by which a rocket cannot fail to hit the Moon are possible. Even now, it would be very interesting to conduct flights around the Moon and to obtain various data concerning the physics of the Moon and its surrounding regions. Especially interesting results could be obtained if television apparatus were used to transmit pictures of the Moon to Earth.

The fact that Soviet technology has the capability of building controlled cosmic rockets is especially important, and can also lead to other far-reaching actions. In particular, the creation of controlled and recoverable artificial earth satellites in the near future is already fully possible. It is also already possible to dispatch pilots and scientific workers in such satellites for training them for distant interplanetary flights. ("Triumph of Soviet Science and Engineering," by Prof V. Dobronravov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 16 Sep 59, p 2)

Proceeding of Conference on Visual Obervation of Satellites

The Second All-Union Conference of the heads of the stations for the visual observation of artificial Earth satellites was held in Moscow, 15-17 April 1959. It was called by the Astronomical Council of the Academy of Sciences USSR to exchange accumulated experience and survey developments in the work.

After opening the conference, A. G. Masevich, the representative of the president of the council, announced that 72 stations operating in the Soviet Union had made 23,500 visual observations on artificial Earth satellites during 1958. In addition, 17,000 observations of Soviet satellites were made in other countries.

In the subsequent talks, there were brought up certain problems in the analysis of the material obtained and problems concerning the orbit characteristics of cosmic objects. After surveying the characteristics of interplanetary flights, A. Mashkov showed that consideration of planetary orbits influences the choice of optimal flight parameters. Yu. V. Batrakov discussed an analysis of the accuracy of the optical observations being made at the Institute of Theoretical Astronomy and spoke of how these same observations are being used to give a more accurate picture of the structure of the atmosphere at high altitudes and about the shape of the Earth. From photographic observations, which have a high accuracy, but of which there are comparatively few, it is possible to obtain the height of the perigee above the surface of the Earth and the inclination of the orbit. The first quantity changes relatively slowly with time, but the second remains practically constant. The quickly changing elements, the longitude of the node, and the period may be determined with a sufficient degree of accuracy from the many visual observations. Work has begun on determining the oblateness of the Earth by the simultaneous use of visual and photographic observations.

Observations on changes in the brightness of Soviet artificial Earth satellites have been greatly expanded, and more than 30 stations have participated in this development. At the Astronomical Observatory of Odessa University, V. P. Tsesevich has analyzed many observations on the brightness of the rocket carrier of the third Soviet artificial Earth satellite which were made at different stations but which refer to the same section of the orbit. He has also constructed a theory which makes it possible to establish the actual period of the tumbling of the rocket and the position of the axis of tumbling in space. A self-recording visual photometer constructed at Riga Observation Station makes it possible to measure the brightness of artificial satellites by comparing it with the brightness of a standard lamp, using an optical wedge (V. V. Shmeling).

Much attention was devoted to reviewing operational methods. In addition to the observation method which involves tying into the stars, certain stations make observations in the horizontal coordinate system wherein the azimuth and altitude of the satellite are computed from circles of the instrument. The second method, which requires careful study of an instrument with counting circles, in many cases makes the work of the observer easier. The first method, however, has great reliability and is now the more generally used. At Ryazan' (V. I. Kuryshev), Tbilisi (G. D. Kvirkveliya), Baku (A. M. Isayev), and Khabarovsk (V. A. Sorokin), the AT-1 telescopes were equipped with horizontal and vertical circles, making observations in the horizontal coordinate system possible.

At Tartu (Ya. E. Eynasto) an instrument has been constructed on the basis of the OT-10 theodelite to observe artificial satellites. The readings on the circles of the instrument are photographed with a "Leningrad" camera. A synchronous contact on the camera is connected to a printed chronograph which records the time of the photograph. This design makes it possible for one observer to make up to 20 measurements of the position of the satellite during a single passing. Papers on the quality of the observations made by the method of tying into stars were delivered by A. Ya. Virin (Smolensk), S. A. Leshakov (Petrozavodsk), and V. M. Kondratenko (Chernovtsy).

V. V. Shmeling told of an instrument developed at the Riga Station which automatically records the coordinates of the satellite when the observer keeps the satellite in the center of the field of vision of the instrument. A. G. Sukhanov (Vladivostok) and V. A. Merkushov (Novosibirsk) told of methods used at their stations to determine the coordinates of the satellite on the basis of the coordinates of the stars close to it.

M. Kh. Kadyrov shared his experience at the Ashkhabad Station. V. N. Gimmel'farb (Arkhangel'sk), who was instructed by the Astronomical Council to become acquainted with the operation of a number of stations, discussed the difference in the methods used by the observers.

A group of papers was devoted to the problems of ephemeris service. As distinguished from the ephemerides for Soviet satellites, which contain the visible location of the satellite calculated for each station at a given moment, only the elements of the orbit of the US satellites were distributed plus the so-called "subsatellite points," which are the points at the Equator above which the satellite passes in the zenith. Once a week there are usually given the longitudes of two consecutive crossings of the Equator and their times. This method requires additional painstaking work at the observation station. To lighten this work, the station at Dnepropetrovsk (V. E. Solob'yev) has computed special tables and the station at L'vov (I. A. Klimashin) has developed a polygraphic approximation of the calculations.

Optical barriers of AT-1 telescopes have been set up at the stations to observe weak artificial satellites. Calculation methods and the equipment for these barriers was a subject of papers by V. N. Ivanov (Krasnodar) and Ya. E. Eynasto (Tartu). V. M. Grigorevskiy (Odessa) told of the preliminary results of an analysis of observations on the brightness of the second Soviet artificial Earth satellite. A. K. Osipov described an instrument constructed by N. A. Yakovkin at the station of Kiev University. The telescope of the instrument automatically tracks the satellite in accordance with the ephemeris. The observer uses a micrometer screw to

correct the motion of the instrument by keeping the satellite on the cross-hairs of the telescope. The readings of the circles are photographed each second during the flash of a pulse lamp which is controlled by an exact clock.

The Conference was also acquainted with work in photographing bright artificial satellites with small cameras. A. I. Konstantinov delivered a short paper on methods for recording the time exactly.

Workers in the observer stations and astronomical institutions were also acquainted with work abroad on the optical observation of artificial satellites. L. A. Panaiotov told of the state of the subject of the work in Hungary, K. A. Barkhatova in Rumania, S. A. Pakhuta in Poland, and A. G. Masevich in the US.

Ye. Z. Gindin delivered a paper on organizational problems in the stations. The conference decided on the basic directions in the operations of the visual observation stations.

The participants in the conference watched documentary and popular science films on artificial Earth satellites. ("Visual Observations on Artificial Earth Satellites," by G. A. Leykin, Candidate of Physico-mathematical Sciences; Moscow, Vestnik Akademii Nauk SSSR, No 7, Jul 59, pp 106-107)

Flight Paths of Earth and Solar Satellites

This popular article on some of the fundamentals of the mechanics of motion of artificial earth and solar satellites includes the following items of discussion:

It is of practical advantage if a satellite is at the perigee at the moment it goes into orbit, since, in such a case, the least amount of fuel is expended. In all other cases with similar characteristics of altitude at perigee and apogee, the energy expenditure is greater, since the possibility of decreasing the initial velocity slightly does not compensate the additional energy required to achieve greater initial altitude.

According to published information, the perigee and apogee of Sputnik I on the first day after launching were 947 and 228 kilometers, respectively, and the period of revolution was 96.15 minutes. On the basis of these data, it is possible to compute approximately the eccentricity and the major semiaxis of the corresponding orbit. At the moment it went into orbit, Sputnik I was about 228 kilometers above the surface of the earth and was traveling at about 7,973 meters per second. As it approached the apogee, its speed was reduced to 7,189 meters per second. With such a comparatively low initial altitude (in comparison with the radius of the earth), the inclination of the direction of the initial velocity to the horizontal is dangerously small. At a height of 228 kilometers and a velocity of 7,973 meters per second, and an angle of 0.7 degrees to the horizontal, the perigee is reduced by 80 kilometers to only 148 kilometers. During the change of the initial velocity, there is a considerable change of the maximum (apogee) altitude of the orbit. On the first day after launching, sputniks II and III had, according to published reports, almost the same minimum altitude over the surface of the earth (about 225-225 kilometers), but a considerably greater difference in the maximum altitudes (1,671 and 1,880 kilometers, respectively). It can be computed that these sputniks, at the moment they went into orbit, had velocities of about 8,150 and 8,197 meters per second, respectively. The increase of the initial velocity of Sputnik II over that of Sputnik I was about 177 meters per second, or only 1.8 percent; for Sputnik III, it was 224 meters per second, or 2.8 percent.

For the first Soviet cosmic rocket, launched 2 January 1959, approximate data was published on the location of the rocket in space at various times. At 0600 on 3 January (Moscow time), it was located at a distance of 137,000 kilometers from the earth above a point on the surface of the earth with coordinates 04 30 [N] and 63 30 [E]. At 0559 on 4 January (34 hours after launching), it passed the moon at a distance of about 7,500 kilometers from the surface of the moon. By analyzing these data, it is

possible to arrive at the conclusion that the rocket traveled at all times very near to the plane of the earth's orbit, and it is also possible to plot the trajectory of the rocket (in that plane). At the moment of closest proximity of the rocket to the moon, the moon was very close to the plane of the ecliptic (about 8,400 kilometers away), and was about 37,000 kilometers from the earth. As it passed the moon, the rocket traveled in an almost straight line, but at a certain point its trajectory changed direction as a result of the attraction of the moon. The velocity of the rocket exceeded the parabolic velocity; thus the rocket traveled along a hyperbolic orbit until the change of direction as a result of the attraction of the moon. Between 13 and 16 hours after launching, the rocket had an average velocity of 2.61 kilometers per second, whereas the parabolic velocity at this distance is 1.953 kilometers per second. According to a formula given in the article, at a distance of 6,578 kilometers from the center of the earth (about 200 kilometers above the surface), the rocket would have a velocity of from 11,167 meters per second (for an energy constant = $3.5 \cdot 10^6$) to 11,176 meters per second (for an energy constant = $3.7 \cdot 10^6$). The parabolic velocity at this point, however, would be 11,009 meters per second. ("Rules of Motion of Artificial Celestial Bodies," by Yu. A. Ryabov, Moscow; Moscow; Priroda, No 8 Aug 59, pp 11-18)

Rocket Impact Observed, Claims Hungarian Scientist

According to a report in the Hungarian newspaper Nepszava, the impact of the Soviet cosmic rocket with the surface of the Moon was observed by Miklos Lovas. Lovas used a telescope at the Astronomy Institute of the Hungarian Academy of Sciences in Csilleberc. The sighting took place at 2202 hours [time not further noted] on 13 September. ("The Crucial Moment"; Budapest, Nepszava, 15 Sep 59, p 3)

Hungarian Reports on Soviet Moon Rocket

Laszlo Detre, director of the Astronomy Institute of the Hungarian Academy of Sciences, reviewed the history of rocket research, ultraviolet photographs of the Sun, discovery of cosmic gas clouds radiating only in ultraviolet frequencies, and the discovery of high-energy particles trapped in the Earth's magnetic field and stated that the new rocket will test the magnetic field of the Moon.

Members of the Executive Committee for Space Navigation (Urhajozasi Intezo Bizzottsag) evaluated the significance of the rocket using data already at hand. Both the amateur observation stations and the recently established moon tracking station at Rakosliget are equipped for observations. Jozsef Sinka, secretary of the Executive Committee for Space Navigation,

briefly outlined the theoretical considerations in calculating a rocket trajectory for impacting the Moon. Istvan Gyorgy Nagy [or Gyorgy NagyIstvan] a member of the committee and a mechanical engineer, emphasized that the technical data on this rocket generally agree with those on the previous space rocket. The initial weight of the present rocket could have been about 400 tons. ("Significant Days in the History of Science -- Hungarian Statements on the New Cosmic Rocket"; Budapest, Nepszabadsag, 13 Sep 59, p 2)

II. UPPER ATMOSPHERE

Hungarians Make Systematic Study of Lunar Surface

Hungarian astronomer Lajos Bartha, Jr (who, along with Karoly Gauser, was elected a regular member of the International Lunar Society in recognition of his work) has given the following report on Hungarian work in this field:

"Regular study of the Moon was begun 10 years ago at the Urania Observatory in Budapest. Since 1957, observations have been extended to include the entire lunar surface, using perfected methods. At the same time, research was begun pertaining to the formation of the lunar surface and to the magnetic field of the Moon. On the basis of observations made so far it has been planned to carry out a systematic study of the changing spots on the Moon. Several foreign observatories have been included in this program.

"The Hungarian astronomers have achieved very good results in theoretical research. In connection with the orgin of lunar formations, Peter Hedervari, a scientific worker at the Lorand Eotvos Geophysical Institute, and Aurel Ponori-Thewrewk, a worker at the Urania Observatory, did experiments worthy of international attention. Peter Hedervari tried to apply the Laszlo Egyed dynamic Earth model to the Moon. His calculations on the thickness of the lunar crust are interesting. By plotting the hypsometric curve of the lunar surface and comparing it to that of the Earth he concluded that the crust of the Moon might be 45 kilometers thick.

"The most interesting examination pertaining to the physics of the Moon is the study of lunar magnetism. For the time being, there can be no direct measure of the magnetic field of the Moon; only a lunar rocket equipped with magnetometers could do this. However, the Hungarian researchers attempted to determine the magnetism of the Moon by indirect methods. According to the observations, magnetic disturbances are greatest 2 days before and after the new moon and are least at the time of the new moon. The Hungarian astronomers are expanding their research program and are planning photographic observations as well." ("The Crust of the Moon is 45 Kilometers Thick -- Most Recent Achievements of Moon Observations by Hungarian Astronomers"; Budapest, Magyar Nemzet, 30 Aug 59, p 4)

III. GEOMAGNETISM

Hungarians Make Systematic Study of Terrestrial Magnetism

Researchers at the Tihany Observatory of the Lorand Eotvos Geophysical Institute make regular measurements of terrestrial magnetism using modern equipment. The measurements show that the exceptionally great fluctuations of terrestrial magnetism are interdependent with the magnitude of solar eruptions and with the weather. A few days ago, solar eruptions produced a greater amount of electricity than usual in the atmosphere, increasing terrestrial magnetism almost six times. Instead of the usual 30-40 gammas, the instruments showed 220. Soon, the magnitude of terrestrial magnetism will be used to predict weather. Terrestrial magnetism data are also useful to mining researchers. If the instruments of geologists at a site show data deviating from that received from the institute, then it can be hypothesized that some as yet undiscovered mineral deposit is causing the irregularity. ("Terrestrial Magnetism Is Being Studied at the Tihany Observatory"; Budapest, Magyar Nemzet, 26 Aug 59, p 3)

IV. OCEANOGRAPHY

Zarya in Bombay

The Zarya, Soviet nonmagnetic expeditionary ship, is now in Bombay. A telegraph report from B. Bologov, chief of the expedition says the ship has been in port 3 days.

The Zarya's scientists will visit the Indian magnetic observatory Alibag [sic], which is located to the south of Bombay. Work according to the IGC program will be conducted in the observatory. An invitation to visit the seismic observatory on 26 September has been accepted. Somewhat later, visits will be made to the universities and institutes of basic research.

The ship will remain in Bombay several days longer than planned. Because of the interest it has aroused among the Indian people, an "open door" day has been planned to make it possible for the city's populace to visit the schooner. ("Zarya Has Reached Bombay," by B. Bologov; Moscow, Izvestiya, 24 Sep 59, p 4)

Vityaz Sailing for Indian Ocean

The Soviet scientific research ship Vityaz was scheduled to sail from Vladivostok for the Indian Ocean on 23 September, according to a report by G. N. Ivanov-Frantsevich, Candidate of Geographical Sciences, a member of the expedition.

The expedition, headed by Prof V. G. Bogorov, Corresponding Member of the Academy of Sciences USSR, will conduct a complex program of research operations according to the program of the IGC. The voyage, the longest so far undertaken by the Vityaz, will last 189 days. The ship will visit Bombay, Colombo, Tananarive in Madagascar, and Djakarta. ("Vityaz Is Going to the Indian Ocean"; Moscow, Izvestiya, 23 Sep 59, p 3)

Soviet Ship to Conduct Research in Mediterranean

The Soviet research ship Loz 60, which arrived in Port Said on 13 August, departed on 15 August for the Mediterranean Sea, where it will conduct submarine research in connection with the IGC program. ("USSR to UAR"; Cairo, al-Ahram, 15 Aug 59)

V. ARCTIC AND ANTARCTIC

Severnyy Polyus-6 To Be Abandoned

It is planned to evacuate the staff members of the station Severnyy Polyus-6 by plane at the beginning of October, when the ice floe is expected to be located 1,000-1,100 kilometers west of Zemlya Frantsa Iosifa. One of the powerful Soviet icebreakers will also be located in this area to assist in the operation. In addition, a hydrological expedition aboard the schooner Shtorm will patrol along the ice edge in the northern part of the Greenland Sea, beginning with the end of September; this expedition will be headed by V. A. Shamont'yev, scientific associate of the Arctic and Antartic Institute.

The station Severnyy Polyus-6 has been in operation for almost 4 years and has traveled about 3,000 kilometers in a general direction. It has crossed the ocean from the Bering Strait to the Greenland Sea. A large amount of scientific material has been collected, which has contributed a great deal to available information on the nature of the Central Arctic Basin. ("The Drift Is Becoming Dangerous," Moscow, Sovetskiy Flot, 30 Aug 59)

Evacuation of Severnyy Polyus-6 Begins

According to radiograms received by the Arctic and Antarctic Institute from station Severnyy Polyus-6, the evacuation of equipment from the ice floe has begun. It was decided to leave one of the huts, food supplies, some equipment, a cylinder with gas, and household items. A letter will be left behind under glass on the table in the hut, written in Russian and English and reading as follows: "Dear travelers! Soviet polar workers of the station Severnyy Polyus-6 lived and worked in this hut in the same of science for 3 1/2 years. In abandoning the ice floe, we are leaving behind this hut with a supply of food and other items which may be vitally necessary to some travelers. We would be glad if our hut would serve as a shelter, the food supplies would sustain your strength, and the fire give you warmth. We wish you, unknown travelers, success and good luck." ("In Abandoning the Ice Floe," Moscow, Izvestiya, 12 Sep 59)

Members of Satellite Countries to Join Soviet Expedition

The Fifth Soviet Antarctic Expedition, which is to leave in November on the Ob' and the Yevgeniy Tolstikov [sic], will include about 160 persons, among whom there will be some Polish, Czechoslovak, German, and possibly some Chinese scientists, in addition to the Soviets. The expedition, directed by Yevgeniy Korotkevich, will conduct research and studies planned under the IGC. ("Poles, Czechs, and Germans Will Accompany Soviets to Antarctic," Paris, L'Humanite, 11 Sep 59, p 8)

Geological Research in Antarctica Continues

In the fall of 1959, a new group of geologists will leave Leningrad as members of the Fifth Soviet Antarctic Expedition and will be headed for the coast of Queen Maud Land. The group will remain in Antarctica for a one-year period, devoting its chief attention to a geological survey of all mountain ranges of Queen Maud Land.

As a result, a geological map and a detailed description of the geological structure of this far-away region will be compiled. The processing of the collected materials should help to clear up many problems regarding the origin of the oldest metamorphic and magmatic rocks on the Earth.

Soviet geological research in Antarctica will be continued during the following years. Together with the research of other countries, it will enable the compilation of a geological map of the whole continent at some time in the future, and will assist in the solution of a number of problems pertaining to the structure of the Earth's crust and to historical geology. ("In the Country of Blizzards," Leningradskaya Pravda, 11 Aug 59)

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